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Publisher Taylor & Francis

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MOLECULAR CRYSTALS AND LIQUID CRYSTALS	
Volume 442 • 2010	
CONTENTS	
Liquid Crystals	
Structural Influence of Functional Polymers on Liquid Crystals	1
V. A. Podkoren, V. A. Malozemov, I. A. Gilevskiy, A. P. Shcherbakov, I. A. Rudakovskiy, V. P. Kabanov, A. A. Zolotarev, and M. I. Stetsko	
Temperature-Induced Permeation of Nitrobenzene through Graphene/Graphite Liquid Crystals Embedded in Cellulose Matrix Structures	10
Ramona Dancu, Elena Kholodovskaya, and Patrick Attali	
Crystal Structure of an Anthracene/Thienopyranone Derivative	21
B. Sengupta, M. N. Perumal, and M. Sathya	
Liquid Crystal Alignment on Anisotropic Nanoscale Phase Patterned Substrates	41
J. H. Burdick and C. A. Olsson	
Indirect Coupling between Rings in Short and Long-range in Liquid Crystals	51
M. S. Plesner	
Indirect as a Structural Element in Columnar Liquid Crystals: Thermal, Solubility and General Substitution	61
V. S. Plesner	
Liquid Crystals: Solvent Gas Barriers	81
M. S. Plesner	
Synthesis, Reactions, and Spectroscopic Characterization of New 9,10-Bis and Their Cyclic, PDE Complexes	101
J. G. Chen and Y. Zhao	
Low Dimensional Solids and Molecular Crystals	
Refractive Index as a Function of Aging Temperature for Poly(phenylenevinylene) Monolayers Adsorbed on Substrates: Experimental and Theoretical Studies	119

## Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713644168>

### A Review of: “*Handbook of Thiophene-Based Materials: Applications in Organic Electronics and Photonics*, Vols. 1 and 2, I. F. Perepichka & D. F. Perepichka”

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First published on: 20 October 2010

**To cite this Article** Sandman, Daniel J.(2010) 'A Review of: “*Handbook of Thiophene-Based Materials: Applications in Organic Electronics and Photonics*, Vols. 1 and 2, I. F. Perepichka & D. F. Perepichka”', *Molecular Crystals and Liquid Crystals*, 528: 1, 193 — 194

**To link to this Article:** DOI: 10.1080/15421406.2010.505257

**URL:** <http://dx.doi.org/10.1080/15421406.2010.505257>

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## Book Review

*Handbook of Thiophene-Based Materials: Applications in Organic Electronics and Photonics*, Vols. 1 and 2, I. F. Perepichka & D. F. Perepichka, John Wiley & Sons, Ltd., Chichester, UK, 2009; xxii + 865 pages; \$320.00 (ISBN 978-0-47005732-2)

Editors Igor and Dmitrii Perepichka are congratulated for assembling the authors to put together quite a comprehensive and up-to-date treatment of thiophene oligomers and polymers for electrical and optical applications. In their preface, they note that it is 10 years since Wiley published *Handbook of Oligo- and Polythiophenes*, edited by D. Fichou, and that there has been significant progress since then. Their two-volume work brings together 22 chapters by a total of 50 authors. The scope of the work is clearly multidisciplinary, with topics including synthetic chemistry, device fabrication, and theory. The variety of subjects covered testifies to the variety of current applications for which thiophene materials are found useful. Even the casual browser of these volumes will be impressed by the massive amount of material that is reviewed and discussed. The books contain a foreword of historical significance by Fred Wudl.

Volume 1 is titled *Synthesis and Theory*. It consists of six chapters on synthesis and two on theory. The first chapter on oligothiophenes by Peter Bäuerle and coworkers is almost a book in itself. Equally strong but not as lengthy is chapter 2 on regioregular poly-3-alkylthiophenes by R.D. McCullough and coworkers. These are followed by chapters on fused oligothiophenes, thiophene-S,S-dioxides, oligo- and polythiophenes containing transition metals, and selenophenes.

The two chapters on theory (by M. Kertesz and coworkers and M. Bendikov and coworkers) focus on semiempirical, *ab initio*, and density functional theory (DFT; including time-dependent DFT) methods for assessment of band gaps and spectra.

Titled *Properties and Applications*, Vol. 2 consists of 14 chapters concerned with a variety of electrical and optical applications. Chapter 9 deals with electrochemistry of oligomers and polymers. It would have been more useful if the processes were described as reversible, quasireversible, or irreversible. Chapters 10 and 11 deal with laser action and field effect transistor (FET) applications of oligomers. Chapter 12 deals with polymers that have been functionalized with groups to render them smectic liquid crystals and ferroelectric liquid crystals. The degree of regioregularity of these materials is not discussed. Chapter 13 deals with assembly from the scanning tunneling microscopy (STM) perspective, and chapter 14 deals with poly(ethylenedioxythiophene) (PEDOT) and its properties. Chapter 15 concerns polymers for capacitors. Chapters 16 and 17 discuss oligomers and polymers for FET applications. Chapter 18 deals with photovoltaics. Electroluminescent applications are the subject of chapter 19. Chapters 17 and 19 are both somewhat repetitive of McCullough's chapter 2. Chapter 20 is concerned with electrochromics, and chapter 21 deals with photochromics. Chemical and biological sensors are discussed in chapter 22.

On the whole, this two-volume work will prove invaluable to beginning students as well as experienced researchers.

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